

Novel phosphorus-containing halogen-free ionic liquids: effect of sulfonate anion size on its physical properties, biocompatibility, and flame retardancy

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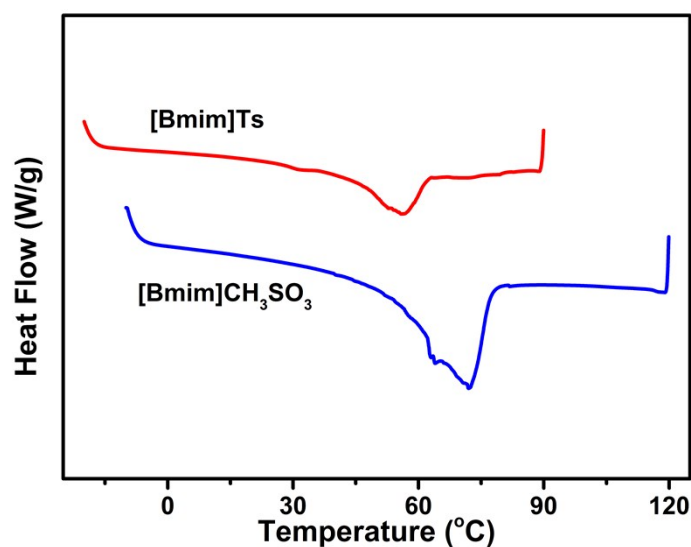


Fig. S1 DSC first heating scans of [Bmim]CH₃SO₃ and [Bmim]Ts at 10 °C min⁻¹.

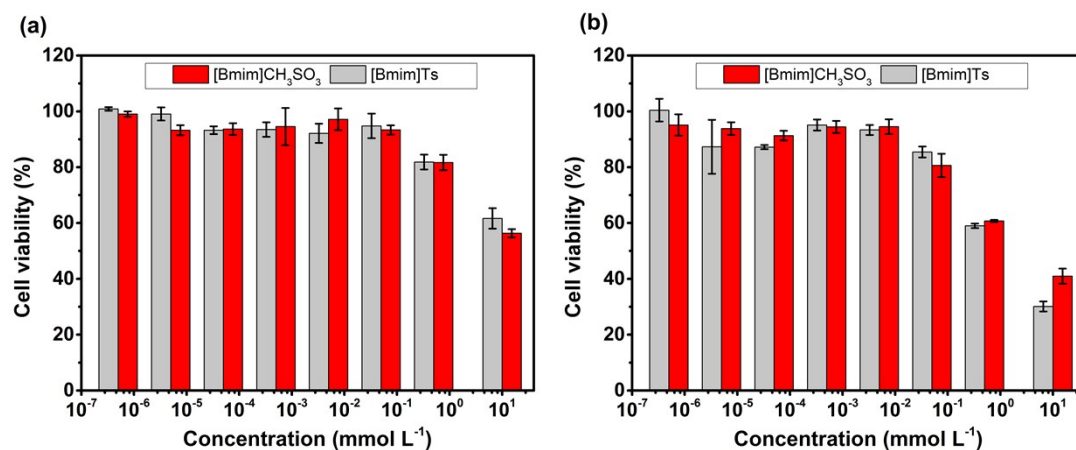


Fig. S2 Effect of different [Bmim]CH₃SO₃ and [Bmim]Ts concentrations on Hela cell viability for (a) 24 h and (b) 48 h.

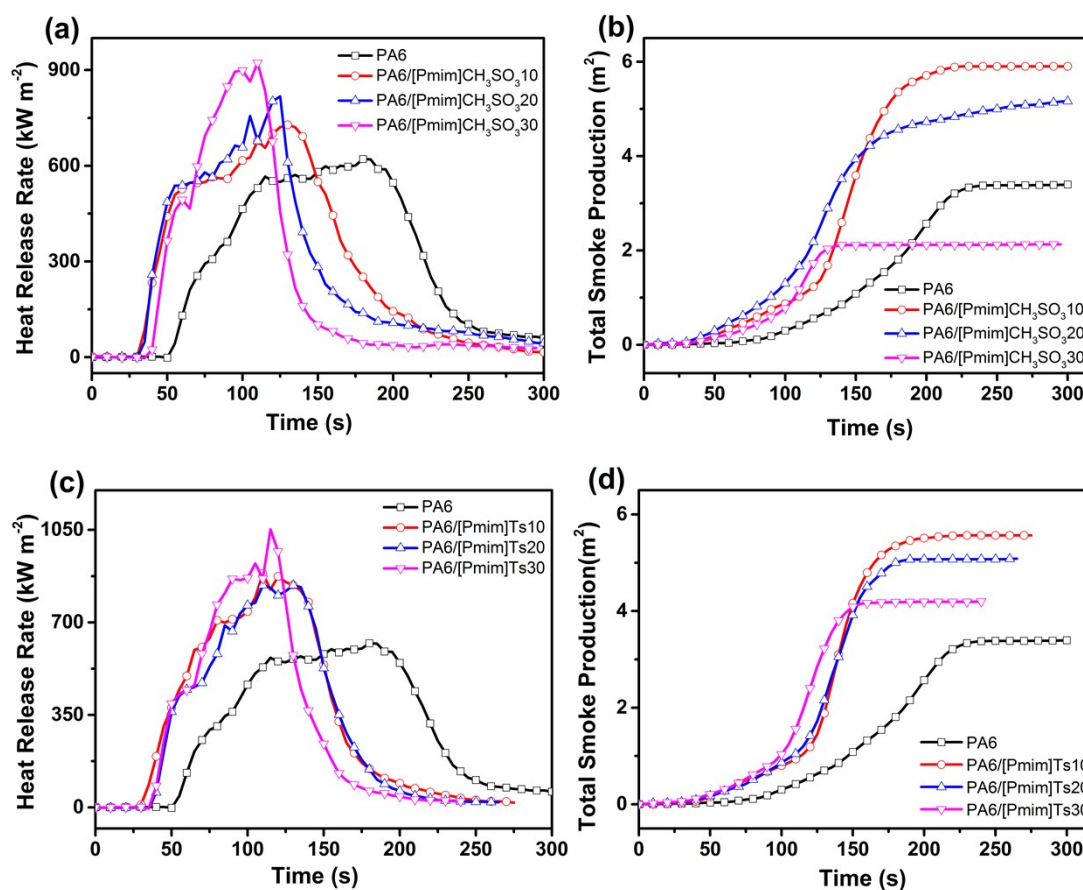


Fig. S3 The heat release rate (HRR) curves of samples: (a) (b) and the total smoke production (TSP) curves of samples: (b) (d).

Table S1. The Cone test data of PA6/ILs.

Sample	TTI (s)	PHRR (kW m ⁻²)	THR (MJ m ⁻²)	TSP (m ²)	Mean EHC (MJ kg ⁻¹)	Residue (%)
PA6	41	621	93	3.4	30.1	0.2
PA6/[Pmim]CH ₃ SO ₃ 10	25	728	87	5.9	27.8	3.7
PA6/[Pmim]CH ₃ SO ₃ 20	29	817	81	5.2	25.9	7.0
PA6/[Pmim]CH ₃ SO ₃ 30	32	923	67	2.1	24.9	17.1
PA6/[Pmim]Ts10	24	885	89	5.6	29.2	4.6
PA6/[Pmim]Ts20	31	841	82	5.0	27.5	8.5
PA6/[Pmim]Ts30	31	1052	75	4.1	26.3	15.1

Table S2. Thermal degradation activation energy of samples calculated by Flynn - Wall-Ozawa.

Conversion α (%)	Activation energy E (kJ mol ⁻¹)							
	5	10	15	20	35	50	60	70
PA6	163	180	186	188	202	213	221	223
PA6/[Pmim]CH ₃ SO ₃ 10	145	154	158	162	172	173	172	171
PA6/[Pmim]CH ₃ SO ₃ 20	158	172	175	178	179	180	179	176
PA6/[Pmim]CH ₃ SO ₃ 30	145	162	165	168	176	181	179	176
PA6/[Pmim]Ts10	147	161	164	168	171	170	168	167
PA6/[Pmim]Ts20	158	173	178	181	190	194	196	198
PA6/[Pmim]Ts30	161	170	169	169	175	178	180	190